



EXECUTIVE SUMMARY: OCIA TROPICAL STORM HARVEY PRODUCTS – UPDATE 3

Prepared By: Office of Cyber and Infrastructure Analysis (OCIA)

STORM CHARACTERISTICS

As of 1100 EDT, 30 August 2017, Tropical Storm Harvey is located approximately 30 miles northeast of Port Arthur, Texas. Maximum sustained wind speed is 45 miles per hour (mph) with higher gusts. Gradual weakening is forecasted as the center of the storm moves further inland, and is expected to become a tropical depression by Wednesday, 30 August 2017 night. The storm is moving north-northeast at approximately 8 mph. It is expected to continue on that track through Thursday, 31 August 2017 and then turn toward the northeast the evening of Thursday, 31 August 31, 2017 and into Friday, 1 September 2017. Within the impacted area in Louisiana, there are no facilities that meet the threshold for infrastructure of concern.

SCOPE NOTE: This Executive Summary highlights the most recent OCIA products, as of 30 August 2017, related to Tropical Storm Harvey for Private Sector Partners.

PUBLISHED WEDNESDAY, 30 AUGUST 2017

Tropical Storm Harvey: Petroleum Availability

National gasoline prices have begun to rise from \$2.347 on 23 August 2017—the day before Storm Harvey was upgraded to Hurricane Harvey—to \$2.402 on 29 August 2017. The rate of price increases appears to be rising. As expected, the largest weekly gasoline price changes are occurring in areas that are least likely to be resupplied by sea. Kentucky prices have risen the most, at \$0.123 per gallon, South Carolina, Georgia, West Virginia and Ohio have risen by about \$0.10, per gallon. North Carolina, Alabama, Delaware, and Tennessee have increased by about \$0.07 - \$0.09 per gallon.

Tropical Storm Harvey: Infrastructure Impact Summary – Southwest and Central Louisiana

The storm has started to move north-northeast. The National Weather Service estimates that the outer bands of Storm Harvey are expected to produce additional rain accumulation of 3 to 6 inches from southwestern Louisiana and the adjacent border of eastern Texas northeastward into western Tennessee and Kentucky through Friday, 1 September 2017. Isolated storm totals could reach up to 10 inches. The rain may lead to flooding concerns across isolated areas. Regional impacts are likely to be moderate to low for the Dams, Water and Wastewater Systems, Transportation Systems, and Commercial Facilities Sectors. National impacts to the Oil and Natural Gas Subsector may become apparent as the tropical system continues to progress through central Louisiana and into the Tennessee Valley. Rising flood waters will limit the production of gasoline, diesel, and natural gas. However, OCIA does not anticipate widespread electric power outages, and current dam status and precipitation data indicate no potential dam failures within the impacted Louisiana area. OCIA flood simulation, based on NOAA precipitation

forecasts for the next 5 days, does not indicate widespread severe flooding for southwest and central Louisiana into the Arkansas, and western Tennessee.

Tropical Storm Harvey – Wastewater Systems – Update 3

AN EARLIER REPORT WAS ISSUED 25, 26, AUGUST 2017

OCIA has updated its flood projections to focus on additional potential flooding due to Tropical Storm Harvey in the area between Houston, Texas, and Lake Charles, Louisiana. This analysis focuses on wastewater assets of highest potential consequence if disrupted. As of 1500 EDT 30 August 2017, the Environmental Protection Agency has reported that the Houston area wastewater treatment systems are still operational and pressurized, and there are no immediate concerns, despite continued severe flooding. If these facilities experiences sufficient damage to degrade operations, flooding will make it difficult for workers to get equipment to the site and to do any adjustments and maintenance.

PUBLISHED TUESDAY, 29 AUGUST 2017

Tropical Storm Harvey - Infrastructure Impact Summary – Update 5

AN EARLIER REPORT WAS ISSUED 24 – 28 AUGUST 2017

No dams are currently experiencing overtopping. Barker, Addicks, Lake Conroe, and Lake Livingston reservoirs are all currently conducting controlled releases of water. Lake Conroe and Lake Houston are at full capacity. The levee at Columbia Lakes has been breached, flooding the surrounding properties. OCIA assesses that local and regional impacts to all critical infrastructure sectors in the affected area are anticipated to continue. Electric utility crews are safely restoring power as quickly as possible, but the storm's continued wind, rain, and flooding could disrupt and hamper restoration efforts. In affected areas, restoration is dependent flood waters receding allowing a damage assessment to be completed on affected infrastructure assets. Local impacts are likely to be high for the Energy, Dams, Water and Wastewater Systems, Transportation Systems, and Commercial Facilities Sectors. National impacts to the Energy Sector may become apparent as rising flood waters limit the production of gasoline, diesel, and natural gas.

Tropical Storm Harvey - Infrastructure Impact Summary – East Texas and Louisiana

The storm has begun to move north-northeast. This Infrastructure Impact Summary will assess the impacts to Jefferson and Orange Counties in Texas and Cameron, Calcasieu, and Jefferson Davis Parishes in Louisiana. For impacts to the Houston metropolitan area, please see Infrastructure Impact Summary – Update 5. The National Weather Service is estimating additional rain accumulation of 6 to 12 inches over the upper Texas coast and into southwestern Louisiana through Friday. This will worsen existing flooding and increase impacts to local critical infrastructure. Regional impacts are likely to be high for the Dams, Water and Wastewater Systems, Transportation Systems, and Commercial Facilities Sectors. National impacts to the Oil and Natural Gas Subsector may become apparent as rising flood waters limit the production of gasoline, diesel, and natural gas. OCIA does not, however, anticipate widespread electric power, and current dam status and precipitation data indicate no potential dam failures in the area.

Tropical Storm Harvey – Healthcare and Public Health – Update 2

AN EARLIER REPORT WAS ISSUED 25, 26, AUGUST 2017

The potential impacts to the Sector are due to flooding causing extended electric power and water and wastewater outages. OCIA assesses a moderate regional impact will occur to the Healthcare and Public Health Sector in the Houston, Texas (TX) area from the storm. Healthcare facilities will probably continue to be affected

by severe flooding and electric power and water service outages, which decrease healthcare facilities' capability to administer routine and emergency medical services. According to 29 August 2017 communication with Texas protective security advisor (PSA) personnel, Ben Taub Hospital has initiated a phased evacuation of 60 out of 350 patients to Memorial Hermann Hospital located next to its facility.

Tropical Storm Harvey: Dams – Update 2

AN EARLIER REPORT WAS ISSUED 25, 27 AUGUST 2017

Heavy rainfall has moved into southeastern Texas and is expected across the upper Texas coast into southwestern Louisiana. The flood threat has spread farther east into Louisiana. OCIA assesses that the storm will continue to have moderate to high local impacts and low national impacts to the Dams Sector. The greatest potential cause of impacts to dams is extended periods of heavy inland rainfall. As of 29 August 2017, the National Weather Service reports the storm is expected to produce additional rainfall accumulations of 6 to 12 inches through Friday, 1 September 2017. Flood warnings and watches are in effect with record flooding predicted for the Houston area.

Tropical Storm Harvey – Drinking Water Systems – Update 2

OCIA has updated its flood projections to focus on additional potential flooding due to Storm Harvey in the area between Houston, Texas, and Lake Charles, Louisiana. This analysis focuses on drinking water assets of highest potential consequence if disrupted. OCIA expects to provide additional information on wastewater facilities on 30 August 2017. As of 1600 EDT, 28 August 2017, all four drinking water purification plants in Houston are operational, despite continued severe flooding. One plant, the Northeast Water Purification Plant, is experiencing flooding. If the plant drops to below 20 percent capacity, the city might be forced to issue a notice to residents to boil their water. Flooding will make it difficult for workers to get equipment to the site and to do any adjustments and maintenance.

Tropical Storm Harvey – Communications

OCIA and the National Cybersecurity & Communications Integration Center assesses that the storm will continue to have moderate regional impacts and low national impacts on the Communications Sector because of power loss, flooding, and wind damage. Impacts to communications assets are mostly attributable to lack of electric power and flooded transportation networks, which can interrupt and postpone generator fuel resupply efforts. Competing higher priority assets such as hospitals may also have a bearing on fuel resupply patterns. Disrupted communications can hinder emergency response and disaster recovery efforts in the near term, and prolonged service outages may result from flooded telecommunication facilities and systems.

PUBLISHED SATURDAY, 26 AUGUST 2017

Tropical Storm Harvey – Impacts of Riverine Flooding on Oil and Natural Gas – Update 1

AN EARLIER REPORT WAS ISSUED 25 AUGUST 2017

OCIA modeling shows expanded riverine flooding, indicating more oil and natural gas facilities are potentially at risk. Eight refineries are located in areas that are modeled to receive 8 to 12 feet of flooding. Sixty-two petroleum or petroleum product facilities (e.g., gasoline, diesel), as well as two natural gas storage facilities, were estimated to be at risk of receiving over 8 feet of flooding. Additional refineries, natural gas processing and storage facilities and petroleum, oil, and lubricants facilities may be impacted by floodwaters less than 8 feet, road closures, or availability of personnel.

Infrastructure System Overview – Extended Water Outages – Re-release (originally released 9 March 2015)

Public health issues could arise with regard to drinking water in flooded zones. A Boil Water Advisory has been issued for Corpus Christi's 325,000 residents and neighboring cities as a result of power outages impacting city wastewater treatment facilities; it is likely that more advisories will be issued if there is any change in pressure or water quality to guard against acute microbial risks. Increased requirements for water supply treatments are also likely as floodwaters enter wastewater treatment areas. If water treatment mitigation options are not sufficient, the public notification would change to "Do Not Drink", though this rarely happens. How long the advisories will remain in effect is conditioned upon power restoration and road access to the affected facilities.

PUBLISHED FRIDAY, 25 AUGUST 2017

Hurricane Harvey – Transportation Systems

OCIA assesses that most transportation systems in the affected area will cease operations during the storm and that recovery efforts may take days to weeks, depending on the level of damage and restoration priorities. Maritime shipping disruptions may be longer than a typical storm because of the likelihood that the storm makes landfall and then heads back into the Gulf of Mexico. Freight rail companies will divert trains, localizing any disruptions to freight shipments. Highways and roads may become impassible due to debris or floodwaters. Storm surge and floodwaters may also be heavily damaged and wash out roads and bridges, potentially impacting local traffic for days or weeks following the storm. Flooding on major routes will force traffic onto alternate routes with less capacity, creating the potential for increased congestion.

Hurricane Harvey – Government Facilities and Emergency Services

Government facilities will be impacted by sustained winds, flooding and related power outages. State and local governments will likely be able to continue providing essential services. Non-critical facilities will be shut down and the workforce evacuated until the storm passes.

The Emergency Services Sector is unlikely to experience significant disruptions to operations. Physical infrastructure may be damaged by flooding, disrupted power, and loss of storage facilities. Police and Sherriff departments may be forced to evacuate jails and prisons and transfer inmates to backup facilities. Fire Departments and Emergency Operation Centers will relocate to backup sites as prescribed by continuity of operations plans while maintaining readiness and response postures.

Hurricane Harvey – Oil and Natural Gas – Update I

AN EARLIER REPORT WAS ISSUED 24 AUGUST 2017

Oil and natural gas companies have significantly curtailed operations. OCIA assesses that the storm will have moderate national impact to the Oil and Natural Gas Subsector and high local and regional impacts. The Gulf Coast is the center of U.S. oil and natural gas operations, accounting for 45 percent of refining capacity. Areas affected directly by the storm and indirectly by pipeline and barge connections have sufficient product (e.g., gasoline, diesel) on hand to withstand a short-term (2 weeks) disruption. Gasoline prices are rising and should continue to rise over the next week. Petrochemical facilities, which rely on petroleum refineries and natural gas processing plants for feedstock, may be at risk for short term curtailments. Operations will resume after oil and natural gas facilities are operational.

Infrastructure System Overview – Extended Electric Outages – Re-release (originally released 4 August 2014)

Based on the slow moving characteristics of the storm and its projected duration over the impacted area, affected areas will likely experience prolonged power outages. Power outages may be in excess of 48-96 hours as restoration efforts will be hindered until high winds and rain subside and flood waters recede. Generally, utilities cannot restore assets when wind speeds are in excess of 30-35 mph.

Full restoration for a significant, widespread event such as a major hurricane could potentially take weeks for all customers to be restored. Electric power service is usually restored methodically with high-priority customers receiving immediate attention, when possible. These high-priority customers include hospitals, water supply facilities, water treatment plants, and emergency services. After the high priority customers have had their power restored, the utilities prioritize repairs in order to restore the largest number of customers in the shortest time.

PUBLISHED THURSDAY, 24 AUGUST 2017

Hurricane Harvey – Electric Power Outages

OCIA assesses that Electricity Subsector assets will be impacted along the Texas coast from the storm because they will experience Category 3 wind speeds in excess of 111 miles per hour. The 51 to 100 percent electric power outage zone contains 20 electric generating stations and 177 substations. The generation assets represents approximately 13,189 megawatts (MW) of generation out of greater than 78,000 MW (approximately 17 percent) of total generating capacity located in the system operation area of the Electric Reliability Council of Texas. This OCIA assessment does not consider specific enhancements that electric utilities may have taken to harden assets.

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Homeland Security

National Protection and Programs Directorate
NPPD Customer Feedback Survey

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2. Please rate your satisfaction with each of the following:

	Very Satisfied (5)	Somewhat Satisfied (4)	Neither Satisfied Nor Dissatisfied (3)	Somewhat Dissatisfied (2)	Very Dissatisfied (1)
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Relevance of product

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- Used contents to improve my own organization's security or resiliency efforts or plans

Yes No If so, which efforts?
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Yes No If so, which partners?
- Other uses (please specify)

Yes No

4. Do you have questions that this product didn't answer?

Yes No (Please specify)

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